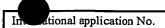● PATENT COOPERATION TREATY ● 10/520508

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 67066-72181	FOR FURTHER ACTION See Form PCT/IPEA/416	
International application No. PCT/SE 2003/001087	International filing date *(day/month/year)* 24-06-2003	Priority date *(day/month/year)* 08-07-2002
International Patent Classification (IPC) or national classification and IPC G06T 11/00, G06T 17/00, G06F 17/14		
Applicant SIDEC TECHNOLOGIES AB ET AL		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of __4__ sheets, including this cover sheet.

3. This report is also accompanied by ANNEXES, comprising:

   a. ☒ *(sent to the applicant and to the International Bureau)* a total of __4__ sheets, as follows:

      ☒ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).

      ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.

   b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s))

      _____ , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

   ☒ Box No. I   Basis of the report

   ☐ Box No. II   Priority

   ☐ Box No. III   Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

   ☐ Box No. IV   Lack of unity of invention

   ☒ Box No. V   Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

   ☐ Box No. VI   Certain documents cited

   ☐ Box No. VII   Certain defects in the international application

   ☐ Box No. VIII   Certain observations on the international application

Date of submission of the demand 14-01-2004	Date of completion of this report 21-10-2004
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. +46 8 667 72 88	Authorized officer Alexander Lakic /LR Telephone No. +46 8 782 25 00

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/SE 2003/001087

Box No. I	Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

   ☐ This report is based on a translation from the original language into the following language _____ , which is the language of a translation furnished for the purposes of:

   ☐ international search (under Rules 12.3 and 23.1(b))

   ☐ publication of the international application (under Rule 12.4)

   ☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the **elements** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):*

   ☐ the international application as originally filed/furnished

   ☒ the description:

   pages __1-13_____ as originally filed/furnished

   pages* _____ received by this Authority on _____

   pages* _____ received by this Authority on _____

   ☒ the claims:

   pages _____ as originally filed/furnished

   pages* _____ as amended (together with any statement) under Article 19

   pages* __14-17_____ received by this Authority on __08-07-2004_____

   pages* _____ received by this Authority on _____

   ☒ the drawings:

   pages __1-2_____ as originally filed/furnished

   pages* _____ received by this Authority on _____

   pages* _____ received by this Authority on _____

   ☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

   ☐ the description, pages _____

   ☐ the claims, Nos. _____

   ☐ the drawings, sheets/figs _____

   ☐ the sequence listing *(specify)*: _____

   ☐ any table(s) related to the sequence listing *(specify)*: _____

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

   ☐ the description, pages _____

   ☐ the claims, Nos. _____

   ☐ the drawings, sheets/figs _____

   ☐ the sequence listing *(specify)*: _____

   ☐ any table(s) related to the sequence listing *(specify)*: _____

* *If item 4 applies, some or all of those sheets may be marked "superseded."*

Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-26	YES
	Claims		NO
Inventive step (IS)	Claims	1-26	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-26	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

Documents cited in the International Search Report:

D1: US 5689629 A
D2: US 5053958 A
D3: US 5654547 A

D1 is considered to be the closest prior art document. D1 discloses a method for reconstructing three-dimensional images from a limited number of two-dimensional projections. Four projections are acquired from real data and a fictitious object is defined, then an arbitrary distribution is defined for the fictitious object, and the four projections are optimized, and a new distribution for the fictitious object is generated. The method modifies the known structure of the fictitious object by comparing its four projections to those of the unknown structure of the real object and continues to iterate until a predetermined limit is reached.

Referring to claims 1-26:

The invention according to claims 1-26 differs from D1 in the way the reconstruction method is performed. That is, the reconstruction method according to claims 1-26 utilizes a prejudice distribution about the object and then said prejudice distribution is refined on the basis of the collected image information. In D1 nothing is mentioned about any prior knowledge/assumption about the object which is to be imaged. D1 simply uses one reference projection to serve as a model, and the said model is iteratively refined to conform to the other projections.

. . ./. . .

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of: Box V

In view of the aforementioned, the claimed invention stated in claims 1-26 is not considered to be anticipated by D1 or any of the other documents cited in the International Search Report. None of these documents or any relevant combination of them reveals a method and apparatus for imaging an object by utilizing a reconstruction method that includes a prior prejudice distribution about the object to be imaged as described in claims 1-26.

According to argumentation stated above, the invention claimed in claims 1-26 is novel, considered to involve an inventive step and has industrial applicability.

10/520508

The Swedish Patent Office
PCT International Application

PCT/SE2003/001087
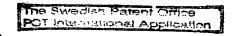08-07-2004

14   JT12 Rec'd PCT/PTO 0 7 JAN 2005

Claims

1. A method for imaging of at least one object, comprising the following steps:

- collecting image information about a sample by means of a microscope,

- selecting a part of said sample to be imaged as a volume

5 - reconstructing the collected image information for said volume using an iterative reconstruction method in which a prior prejudice distribution is refined in at least one step on the basis of a comparison with the collected image information.

2. A method according to claim 1, further comprising the steps of

10 - selecting at least one object within said volume

- analyzing a part of the image information related to said at least one object.

3. A method according to any one of the preceding claims, wherein said reconstruction method is based on the COMET technology.

15

4. A method according to any one of the preceding claims, further comprising the step of selecting the at least one object in dependence of the shape and/or size of the object.

20 5. A method according to any one of the preceding claims further comprising the step of exposing the sample to markers before collecting the image information.

6. A method according to any one of the preceding claims further comprising the step of measuring the information content of the reconstructed image information.

25

7. A method according to any one of the preceding claims wherein the step of collecting image information comprises collecting several 2D-images and further comprising the steps of aligning the 2D-images.

AMENDED SHEET

8. A method according to any one of the preceding claims wherein the step of re-constructing the collected image information comprises reconstructing 3D-data from said 2D-images without deconvoluting the point spread function.

5 9. A method according to any one of the claims 1-7, wherein the step of reconstruct-ing the collected image information comprises reconstructing 3D data from said 2D-images including deconvoluting the point spread function.

10. A method according to any one of the claims 1-7, wherein the step of recon-
10 structing the collected image information comprises first deconvoluting the point spread function for the 2D-images and then reconstructing 3D-data without decon-voluting the point spread function.

11. A method according to any one of the preceding claims, further comprising the
15 step of preparing the sample by means of cryomicrotomy.

12. A method according to any one of the preceding claims, further comprising the step of preparing the sample by means of flash freezing.

20 13. A method according to any one of the preceding claims further comprising the step of displaying the reconstruction on a computer screen.

14. An apparatus for imaging of at least one object comprising the following steps:
- means for receiving image information collected by means of a microscope,
25 - means selecting a part of said sample to be imaged as a volume
- means for reconstructing the collected image information for said volume using an iterative reconstruction method in which a prior prejudice distribution is re-fined in at least one step on the basis of a comparison with the collected image information.
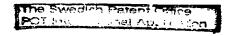
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AMENDED SHEET

15. An apparatus according to claim 14, further comprising .

- means for selecting at least one object within said volume

- means for analyzing a part of the image information related to said at least one object.

5

16. An apparatus according to any one of claims 14-15, wherein said means for re-constructing the collected image information is arranged to apply a reconstruction method based on the COMET technology.

10   17. An apparatus according to any one of the claims 14-16, further comprising means for selecting the at least one object in dependence of the shape and/or size of the object.

18. An apparatus according to any one of the claims 14-17, further comprising

15   measuring means (11) for measuring the information content of the reconstructed image information.

19. An apparatus according to any one of the claims 14-18, further comprising aligning means for aligning several 2D-images related to a sample.

20

20. An apparatus according to any one of the claims 14-19, wherein said reconstruction (9) means for reconstructing the collected image information is arranged to re-construct 3D-data from said 2D-images without deconvoluting the point spread function.

25

21. An apparatus according to any one of the claims 14-20, wherein the means for reconstructing the collected image information is arranged to reconstruct 3D data from said 2D-images including deconvoluting the point spread function. .

AMENDED SHEET

22. An apparatus according to any one of the claims 14-21, wherein the means for reconstructing the collected image information is arranged to first deconvolute the point spread function for the 2D-images and then reconstruct 3D-data without deconvoluting the point spread function.

5

23. An apparatus according to any one of the claims 14-22, further comprising data processing means (11) for measuring the information content of the reconstruction produced by the first computer program (9).

10   24. An apparatus according to any one of the claims 14-22, further comprising auxiliary memory means (7) for storing other data regarding the sample.

25. An apparatus according to any one of the claims 14-22, further comprising structure memory means (8) for storing prior structure data.

15

26. An apparatus according to any one of the claims 14-22, further comprising data processing means (15) for combining the reconstructed or measured data output from the first computer program (6) with the prior structure data comprised in the structure data base (8) to refine the reconstructed image.

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AMENDED SHEET